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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/791,247	03/01/2004	Chun-Hsien Lin	67,200-1130	2810

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EXAMINER

CHAUDHRY, SAEED T

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 08/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/791,247

Applicant(s)

LIN, CHUN-HSIEN

Examiner

Saeed T. Chaudhry

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Applicant's amendments and remarks filed May 24, 2006 have been acknowledged by the examiner and entered. Claims 1-20 are pending in this application for consideration.

Restriction requirement has been withdrawn in view of the amendments to the claims filed May 24, 2006.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- (c) he has abandoned the invention.
- (d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States.
- (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.
- (f) he did not himself invent the subject matter sought to be patented.
- (g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

Claims 1-2, 5-8, 13-15, 17-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Humayun et al.

Humayun et al (6,905,556) disclose a method of cleaning substrates with supercritical cleaning solution. A method of delivering a reagent to a wafer, comprising: providing a solvent; providing a set of conditions of temperature and pressure to the solvent sufficient to bring the solvent to supercritical conditions; providing a reagent; combining the solvent, and the reagent

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to form a solution; and delivering the solution to a supercritical process chamber, wherein the wafer is exposed to the solution in the supercritical process chamber, where the reagent acts to chemically break down material to accomplish removal of the material from the wafer, wherein the solution is supercritical when entering the supercritical process chamber.

Wherein the reagent has a solubility and the supercritical solvent carries the reagent by dissolving the reagent into the supercritical fluid using the surfactant to increase the reagent's solubility. Wherein the solvent is carbon dioxide. Wherein the solvent comprises at least one of carbon dioxide, an alkane, an alkene, an alcohol and ammonia (see claims).

At least one reagent is combined with the solvent. The combination of the supercritical solvent, the reagent, and the surfactant forms a supercritical solution of the invention. The supercritical solution is then delivered to the supercritical process chamber for further use, preferably in wafer processing (see col. 5, line 66 through col. 6, line 15). The reagent and surfactant may be premixed and pumped together into the supercritical solvent, or the surfactant may be added to the solvent before the solvent is made supercritical (see col. 10, lines 64-67). Even further, an additive delivery mechanism may introduce a chemical additive to the subcritical solvent before the solvent is made supercritical, instead of after the solvent is made supercritical see col. 11, lines 22-27).

Humayun et al disclose all the claimed process steps. Therefore, Humayun et al anticipated the claimed process.

Claims 1-4, 7-9, 11-13, 15-17 and 19-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Xu et al.

Xu et al (2003/0125225) disclose a method for removing unwanted solid deposited material from a surface of a substrate having the unwanted solid deposited material thereon, comprising contacting the substrate surface with a cleaning formulation comprising (I) a supercritical fluid comprising a fluid species selected from the group consisting of carbon dioxide, oxygen, argon, ammonia, and mixtures thereof; and (II) a co-solvent comprising a co-solvent species selected from the group consisting of methanol, ethanol, and higher alcohols (see claim 58).

Supercritical fluids are formed under conditions at which the density of the liquid phase equals the density of the gaseous phase of the substance. For example, carbon dioxide (CO.sub.2), which is a gas at standard temperature and pressure, undergoes a transition from liquid to SCF above a critical point, corresponding to T_c 31.1.degree. C. and P_c 72.8 atm (see Paragraph 0032).

A further method aspect of the invention relates to a method of integrated circuit (IC) manufacture on a semiconductor substrate, comprising cleaning the semiconductor substrate to remove organic and/or inorganic material present thereon, wherein such cleaning comprises contacting the semiconductor substrate with a supercritical fluid-based cleaning composition to permeate same into the material, and heating the semiconductor substrate to induce removal of the material therefrom by the action of the supercritical fluid-based cleaning composition (see paragraph 20).

A cleaning composition, including alcohol (e.g., methanol, ethanol, isopropanol) co-solvent in supercritical CO.sub.2 and a fluorinated agent, was added to a cleaning vessel and allowed to equilibrate at 4000 psi at 90.degree. C. (1% w/v fluoride, 15% w/v alcohol). The

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cleaning fluid composition was circulated through the cleaning vessel at a constant pressure and temperature for a predetermined period of time (30-900 seconds). Upon completion, the cleaning composition was displaced with pure supercritical CO.sub.2 and the cleaning vessel was rinsed with three volumes amount of supercritical CO.sub.2 in order to completely remove the cleaning composition from the wafer surface (see paragraph 89).

Xu et al discloses to use supercritical fluid on integrated circuit manufactured on a semiconductor substrate which have conductive surfaces. Xu et al disclose all the limitations as claimed herein. Therefore, Xu et al anticipated the claimed process.

Claims 1-2, 5-8, 13-15, 17-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Vaartstra et al.

Vaartstra et al (6,242,165) discloses a method for removing organic material in the fabrication of structures includes providing a substrate assembly having an exposed organic material and removing at least a portion of the exposed organic material using a composition having at least one component in a supercritical state. The composition includes an oxidizer selected from the group of sulfur trioxide, sulfur dioxide, nitrous oxide, ozone and oxygen. For example, the exposed organic material may be selected from the group of resist material, photoresist residue, UV-hardened resist, X-ray hardened resist, carbon-fluorine containing polymers, plasma etch residues, and organic impurities from other processes. Further, the composition may include a supercritical component in a supercritical state selected from the group of carbon dioxide, ammonia, nitrous oxide; preferably carbon dioxide.

It should be understood, however, that an optional mixing manifold 122 can be used that allows for the mixing of the components prior to their entering the pressure vessel 114 as well

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as allowing for any number of different components to be mixed. Alternatively, each component of the supercritical etching composition can enter the pressure vessel through plumbed supply lines, where the components can then be brought to the supercritical state. The supercritical etching composition is passed over the substrate 116 until the desired organic material is removed (see abstract, claims and col. 9, lines 4-37).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 5-6, 10, 14 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al.

Xu et al were discussed supra. However, the reference fails to disclose specify that the solvent is mixed with cleaning fluid prior to forming supercritical fluid and substrate having N-doped and P-doped.

It would have been obvious at the time applicant invented the claimed process to mix the solvent with cleaning fluid prior to forming supercritical fluid because it has been held obvious

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to change the sequence of mixing the ingredients (see *In re Burhans*, 69 USPQ 330 (CCPA 1946 and *In re Gibson* 5 USPQ 230 (CCPA 1930). Xu et al discloses to mix solvent in the supercritical fluid. Therefore, one of ordinary skill in the art would expect that combining the solvent prior to forming the supercritical fluid would give the same results since the mixture is applied at the critical state of the mixture. Further, Xu et al disclose to clean the surface of integrated circuit on the semiconductor. Therefore, one of ordinary skill in the art expect that the substrate having P-doped or N-doped would be cleaned in the same manner.

The Prior art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Inoue et al (6,962,161) disclose a method for cleaning a substrate by bringing the substrate with supercritical carbon dioxide and additives in a high pressure chamber.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Saeed T. Chaudhry whose telephone number is (571) 272-1298. The examiner can normally be reached on Monday-Friday from 9:30 A.M. to 4:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Michael Barr, can be reached on (571)-272-1414. The fax phone number for non-final is (703)-872-9306.

When filing a FAX in Gp 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communication with the PTO that are for entry into the file of the application. This will expedite processing of your papers.

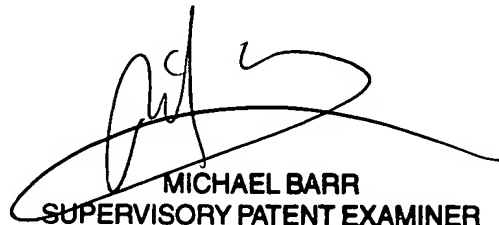
Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (571) 272-1700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information

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Saeed T. Chaudhry
Patent Examiner



MICHAEL BARR
SUPERVISORY PATENT EXAMINER